

Protocol Title: Visibility

Parks: MORA, NOCA, OLYM

Justification:

Among the experiences that visitors to NCCN parks enjoy, treasure, and remember are the breathtaking scenes of majestic mountains contrasted against a pure blue sky, the multitude of stars in the Milky Way – unseen in an urban environment, and the historic vistas viewed by explorers and settlers. The enjoyment and appreciation of these are inextricably linked to clean air. Fine particles suspended in the atmosphere, mostly as the result of human caused air pollution, obscure the scenes' colors, forms, and textures. Haze conditions in the parks diminish the visitor experience. In relatively clean areas like the NCCN parks, small increases in particle pollution perceptibly decrease visibility.

Table 1: Objectives and Basic Approach

| Category | Objective | Basic Approach |
|---|--|--|
| Optical monitoring is accomplished by measuring The amount of light scattered by particles using an instrument called an integrating nephelometer | Measure daily, weekly, and annual light scattering by particles at one site within each Class I NCCN Park (MORA, NOCA, OLYM) | Using NPS-ARD protocols for visibility monitoring with a nephelometer which provides the amount of light scattering as particle scattering coefficient (b_{sp})/m). Optical monitoring is instantaneously measured and hourly averages provided |

| Category | Objective | Basic Approach |
|--|---|--|
| Aerosol monitoring directly measures the light absorbing and scattering particles in the atmosphere. NPS/EPA IMPROVE monitoring sites measure fine mass (PM _{2.5}), course mass (PM ₁₀), and then speciate these into particulate sulfate and nitrate, elemental carbon (soot), organic material, and soil. The speciation of particles helps determine the chemical-optical characteristics and the ability of the particle to absorb water and is important for determining the origin of the aerosol. | Measure weekly and annual light absorbing and scattering particles in the atmosphere | Using the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring protocols, measure fine mass (PM _{2.5} , course mass (PM ₁₀) and speciate these into particulate sulfate and nitrate, elemental carbon, organic material, and soil. Speciation of particles will assist in determining the origin of the aerosol particles, and the chemical-optical characteristics and the ability of the particles to absorb water. Measurements are the amount of particulate (total or speciated) as ug/m ³) and atmospheric extinction in inverse megameters or deciviews. Aerosol monitoring is performed for 24 hours every 3 days. Material collected is analyzed in a laboratory with data turnaround 6 months or more. |
| View monitoring is accomplished through high quality imagery (e.g., web camera or digital camera) that records a set scene under a variety of lighting conditions and aerosol concentrations. | Monitor daily, weekly and annual visual changes from one site within each Class I NCCN park (MORA, Paradise http://www2.nature.nps.gov/air/webcams/parks/moracam/moracam.htm NOCA, Newhalem http://www2.nature.nps.gov/air/webcams/parks/nocacam/nocacam.htm OLYM, Lake Crescent http://www2.nature.nps.gov/air/webcams/parks/olymcam/olymcam.htm); Baseline data exists for SAJH. ¹ For FOVA, a site outside of the park exists 9*Smith Tower http://www.swapca.org/airqual.html | Utilize NPS-ARD existing protocols for air web cams that take photographs and archive them every hour. Visibility cameras take photographs 3 times/day. |

Methods exist to compare data from each of these monitoring schemes. In some cases (e.g., converting aerosol mass data to a value for atmospheric extinction), the value derived is accurate and high quality, in other cases (e.g., deriving an aerosol mass value from a camera image), the value is more qualitative.

Principal Investigator and NPS Lead:

John Ray, NPS-ARD

NCCN Leads: Barbara Samora, NPS, MORA, 360 569-2211 x3372,

Barbara_Samora@nps.gov

Elizabeth Waddell, NPS, PWR, 206 220-4287, Elizabeth_Waddell@nps.gov.

¹ Funding is not available to conduct baseline monitoring at EBLA but this has been identified as a high priority.

Development Schedule, Budget, and Expected Interim Products:

Existing NPS-ARD and EPA protocols will be utilized for all components of visibility monitoring. All protocols will be consolidated into one document by the end of 2005.

Protocol development costs:

FY05: \$4400.00 (air quality funding) will be used to fund a biological technician (2 pp) to pull together protocols into prescribed formats for VSM (Vital Sign Monitoring). No VSM funds will be used to support Visibility monitoring. Park and Air quality funding will support this program.